Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

**Flame Test Lab Packet**

**BACKGROUND:**

BOHR’S THEORY

* Electrons exist in energy levels
* Energy levels are structured like fixed orbits around the nucleus

ELECTRONS’ EXCITING JOURNEYS:

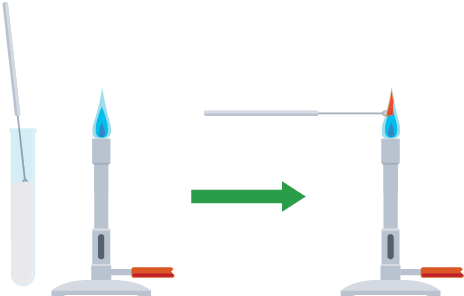
|  |  |
| --- | --- |
| 1. |  |
| 2. |
| 3. |
| 4. |
| 5. |

KEY POINT: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

VOCABULARY:

|  |  |
| --- | --- |
|  |  |

****

**LAB REPORT PROCEDURES**

Excerpt from Ms. Eggleston’s published research paper:

*“Rats in the exercise groups were provided with 24-hour access to a running wheel for 3 weeks prior to the start of the behavioral procedures and continued to have access to the wheels throughout the entire study. The door to the wheel was blocked off two hours prior to behavioral training in order to minimize the potential for exercise-related fatigue. The number of wheel rotations was recorded daily.”*

Requirements of Lab Report Procedures

|  |
| --- |
|  |
|  |
|  |

Practice Turning Directions Into Correctly Formatted Lab Report Sentences

|  |  |
| --- | --- |
| **Directions** | **Correct Format for Lab Reports** |
| Put the cat in the bag and pet it for 3 minutes. |  |
| Pick Eva up and spin her around 2 times. |  |
| Put on your goggles, tie your hair back, and remove loose clothing. |  |

**Your Lab Procedure:**

|  |  |
| --- | --- |
| **Directions** | **Correct Format for Lab Reports** |
| Put on your goggles, tie your hair back, and remove loose clothing. |  |
| Collect all of your materials. |  |
| Use the tip of the scoopula to pick up one of the samples. |  |
| Place the scoopula into the burner flame. Record the color that you observe as the sample is heated in your data table. |  |
| Clean the scoopula. |  |
| Rinse the scoopula. |  |
| Repeat for each of the KNOWN and UNKNOWN samples. |  |

**FLAME TEST LAB SIMULATION**

Niels Bohr used the flame test to study electrons in atoms. Each atom has a unique flame spectrum based on the placement of its electrons. In all of the solutions you will test, it is the metal that gives off the color. The metal is always the first element in a chemical formula. For example, in sodium chloride, NaCl, the first element (Na) is the metal.

SIMULATION: <http://goo.gl/laorVA> (scroll down to part 1)

|  |  |  |
| --- | --- | --- |
| **Name of Metal** | **Flame Color** | **Identity of Metal Based on Flame Test** |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
| Unknown 1 |  |  |
| Unknown 2 |  |  |

**How did you identify Unknown 1 and Unknown 2? Explain the process in your own words.**

**Flame Test Lab Participation Rubric**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Category** | **4** | **3** | **2** | **1** |
| **Safety** | Lab is carried out with full attention to relevant safety procedures. The setup, experiment, and cleanup posed no safety threat to any individual. | Lab is generally carried out with attention to relevant safety procedures. The setup, experiment, and cleanup posed no safety threat to any individual, but one safety procedure needs to be reviewed. | Lab is carried out with some attention to relevant safety procedures. The setup, experiment, and cleanup posed no safety threat to any individual, but several safety procedures need to be reviewed. | Safety procedures were ignored and/or some aspect of the experiment posed a threat to the safety of the student or others. |
| **Use of time during lab** | All time during the lab is used to perform the lab. There is no off-topic talking and no time is wasted. | Almost all of the time is spent talking about the lab and performing the experiment. Only a little off-topic talking. | Only some of the time is spent on the lab and cleanup. There is lots of talk about other subjects. | Little time is spent discussing the lab. |
| **Teamwork** | All members of the group actively participated and helped each other. Any differences were resolved on your own. Ms. Eggleston did not have to speak with the group about teamwork. | Most members of the group participated. Ms. Eggleston had to speak to the team once about teamwork. | Only a few students were participating. Ms. Eggleston had to speak to the group 2-3 times about teamwork. | Most students were not actively involved In the lab. |
| **Following directions** | The lab team followed all written and verbal instructions. | The lab team followed most written and verbal instructions. | The lab team followed some written and verbal instructions. | The lab team did not follow many of the written and verbal instructions. |
| **Clean up** | Everyone helped clean up and put everything back in the correct place. The lab space looks like it did when class began. | Almost everyone helped clean up. One or two things may not have been put back correctly or the area may not be completely cleaned up. The area looks mostly like it did when class began. | Some people helped clean up and some items were put back correctly. The area looks somewhat messy and not like it did when class began. | The lab team did not clean up the lab station. |
| **Use of time after lab** | Students immediately and quietly answer post-lab questions without distracting others. Students remain in seats unless given permission to move. No reminders from Ms. Eggleston. | Students worked on post-lab questions almost immediately and rarely participated in off-topic conversations. Students remain in seats unless given permission to move. One reminder from Ms. Eggleston. | Students required 2 reminders from Ms. Eggleston to begin post-lab questions, remain on task, or stay seated. | Students required more than 3 reminders from Ms. Eggleston to begin post-lab questions, remain on task, or stay seated. |

**THE FLAME TEST LAB**

**INTRODUCTION**

Finally, the lab you all have been waiting for: fire, mystery, and cool colors. Welcome to the flame test mystery! You have been hired by the science mystery institute to investigate why different chemicals produce different colors when exposed to an open flame.

**SAFETY PRECAUTIONS**

* Wear goggles at all times!!! No exceptions!!!
* Be extremely careful around the open flames!!!
* No eating, drinking or horse play during lab
* Restrain all loose clothing and tie back hair

**PRE-LABORATORY QUESTIONS**

1. In your own words, explain why different elements give off different colors when heated.
2. Even though all elements give off unique colors when heated, it’s impossible to identify all elements with the naked eye by doing this test. Why do you think that is?

* **MATERIALS**
* Samples of CaCl2, SrCl2, KCl, NaCl, CuCl2, and LiCl
* 5 unknown solutions
* Bunsen burner
* Small beaker of water

**PROCEDURE**

1. ☐Put on your goggles, tie your hair back, and remove loose clothing.
2. ☐Make sure you have all of your materials.
3. ☐Use the tip of the scoopula to pick up one of the samples.
4. ☐Place the scoopula into the burner flame. Record the color that you observe as the sample is heated in your data table.

**IMPORTANT**: Only record the initial flash of color that you see, NOT the orange-yellow color that comes after the toothpick has been burning for a few seconds. The initial color is the color of the chemical.

1. ☐Clean the scoopula.
2. ☐Repeat for each of the known samples.
3. ☐Repeat for each of the unknown samples.

**DATA TABLE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| PART 1: KNOWN SUBSTANCES | | | | |
| **Chemical Formula of Compound** | **Metal** | **Flame Color** | **Identity of Metal Based on Flame Test** | **Metal’s Abbreviated Electron Configuration** |
| **CuCl2** | **Copper** |  |  |  |
| **LiCl** | **Lithium** |  |  |  |
| **SrCl2** | **Strontium** |  |  |  |
| **CaCl2** | **Calcium** |  |  |  |
| **KCl** | **Potassium** |  |  |  |
| **NaCl** | **Sodium** |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| PART 2: UNKNOWN SUBSTANCES | | | | |
| **Number of Unknown Compound** | | **Flame Color** | **Identity of Metal Based on Flame Test** | |
| **1** | |  |  | |
| **2** | |  |  | |
| **3** | |  |  | |
| **4** | |  |  | |
| **5** | |  |  | |